# LATE PLEISTOCENE AND HOLOCENE GLACIAL EVOLUTION AND ISOSTASY IN THE ANTARCTIC PENINSULA

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Employing a numerical model of Payne et al. (1989) that simulates the late-Pleistocene evolution of the former Antarctic Peninsula Ice Sheet (APIS) as a basis, we compute the present-day postglacial vertical isostasy of this region. The region may also experience significant mid-to late-Holocene glacial mass changes. Climate and oceanographic studies indicate that the ice mass imbalance of this region may be of larger magnitude that elsewhere in Antarctica. We compute the crustal response to these more recent ice mass changes and Holocene fluctuations with a simple gravitating Earth model consisting of an elastic lithosphere and a viscoelastic mantle (half-space). The calculations demonstrate that the present-day response could be significant, possibly at the level of about 4 -11 mm/yr. Such significant crustal motion could be driven by glacial mass changes integrated over the last 1000 years if the regional mantle viscosity is below about 2 x $10^{20}$ Pa sec. In this lower viscosity range, present-day crustal motion has a significant phase-lagged character and the composite lithosphere/mantle viscoelastic response to late-Holocene events dominates over purely elastic (instantaneous) responses to present-day ice mass changes. For a higher mantle viscosity, greater than about 5 x $10^{20}$ Pa sec, the predicted present-day vertical isostasy is dominated by gravitational response to glacial unloading during the 18 - 6 kyr BP collapse of the APIS, and is analogous to that known to be occurring in the Gulf of Bothnia and Hudson Bay.

References

Payne, A.J. D.E. Sugden and Clapperton, C.M. Modeling the growth and decay of the Antarctic Peninsula Ice Sheet, \fIQuaternary Res.,\fR \fB31\fR, 119-134, (1989).